

SEQUENCE LISTING

<110> Pecker, Iris
 Vlodavsky, Israel
 Feinstein, Elena

<120> POLYNUCLEOTIDE ENCODING A POLYPEPTIDE HAVING HEPARANASE ACTIVITY
 AND EXPRESSION OF SAME IN GENETICALLY MODIFIED CELLS

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<170> PatentIn version 3.5

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Leu Ala Thr Asp Pro Arg Phe Leu Ile Leu Leu Gly Ser Pro Lys Leu
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Arg Thr Leu Ala Arg Gly Leu Ser Pro Ala Tyr Leu Arg Phe Gly Gly
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 145 150 155 160

Lys Asn Ser Thr Tyr Ser Arg Ser Ser Val Asp Val Leu Tyr Thr Phe
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Asp Tyr Cys Ser Ser Lys Gly Tyr Asn Ile Ser Trp Glu Leu Gly Asn
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Gln Leu Gly Glu Asp Tyr Ile Gln Leu His Lys Leu Leu Arg Lys Ser
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Arg Lys Thr Ala Lys Met Leu Lys Ser Phe Leu Lys Ala Gly Gly Glu
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Val Ile Asp Ser Val Thr Trp His His Tyr Tyr Leu Asn Gly Arg Thr
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Ala Thr Arg Glu Asp Phe Leu Asn Pro Asp Val Leu Asp Ile Phe Ile
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Ser Ser Val Gln Lys Val Phe Gln Val Val Glu Ser Thr Arg Pro Gly
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Lys Lys Val Trp Leu Gly Glu Thr Ser Ser Ala Tyr Gly Gly Gly Ala
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Pro Leu Leu Ser Asp Thr Phe Ala Ala Gly Phe Met Trp Leu Asp Lys
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405 410 415

Lys Val Leu Met Ala Ser Val Gln Gly Ser Lys Arg Arg Lys Leu Arg
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Val Tyr Leu His Cys Thr Asn Thr Asp Asn Pro Arg Tyr Lys Glu Gly
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Arg Pro Leu Gly Pro His Gly Leu Leu Ser Lys Ser Val Gln Leu Asn
485 490 495

Gly Leu Thr Leu Lys Met Val Asp Asp Gln Thr Leu Pro Pro Leu Met
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Leu Leu Leu Gly Pro Leu Gly Pro Leu Ser Pro Gly Ala Leu Pro Arg
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Pro Ala Gln Ala Gln Asp Val Val Asp Leu Asp Phe Phe Thr Gln Glu
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Pro Leu His Leu Val Ser Pro Ser Phe Leu Ser Val Thr Ile Asp Ala
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Asn Leu Ala Thr Asp Pro Arg Phe Leu Ile Leu Gly Ser Pro Lys
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Tyr Gly Ser Ile Pro Pro Asp Val Glu Glu Lys Leu Arg Leu Glu Trp	130	135	140
Pro Tyr Gln Glu Gln Leu Leu Leu Arg Glu His Tyr Gln Lys Lys Phe	145	150	155
Lys Asn Ser Thr Tyr Ser Arg Ser Ser Val Asp Val Leu Tyr Thr Phe	165	170	175
Ala Asn Cys Ser Gly Leu Asp Leu Ile Phe Gly Leu Asn Ala Leu Leu	180	185	190
Arg Thr Ala Asp Leu Gln Trp Asn Ser Ser Asn Ala Gln Leu Leu Leu	195	200	205
Asp Tyr Cys Ser Ser Lys Gly Tyr Asn Ile Ser Trp Glu Leu Gly Asn	210	215	220
Glu Pro Asn Ser Phe Leu Lys Lys Ala Asp Ile Phe Ile Asn Gly Ser	225	230	235
Gln Leu Gly Glu Asp Tyr Ile Gln Leu His Lys Leu Leu Arg Lys Ser	245	250	255
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Ala Thr Arg Glu Asp Phe Leu Asn Pro Asp Val Leu Asp Ile Phe Ile	305	310	315
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 Lys Val Leu Met Ala Ser Val Gln Gly Ser Lys Arg Arg Lys Leu Arg
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 Val Tyr Leu His Cys Thr Asn Thr Asp Asn Pro Arg Tyr Lys Glu Gly
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 Arg Leu Pro Tyr Pro Phe Ser Asn Lys Gln Val Asp Lys Tyr Leu Leu
 465 470 475 480
 Arg Pro Leu Gly Pro His Gly Leu Leu Ser Lys Ser Val Gln Leu Asn
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 Gly Leu Thr Leu Lys Met Val Asp Asp Gln Thr Leu Pro Pro Leu Met
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 85 90 95

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 100 105 110

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 115 120 125

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Gly Thr Lys Thr Asp Phe Leu Ile Phe Asp Pro Lys Lys Glu Ser Thr
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Phe Glu Glu Arg Ser Tyr Trp Gln Ser Gln Val Asn Gln Asp Ile Cys
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Lys Tyr Gly Ser Ile Pro Pro Asp Val Glu Glu Lys Leu Arg Leu Glu
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Trp Pro Tyr Gln Glu Gln Leu Leu Leu Arg Glu His Tyr Gln Lys Lys
 195 200 205

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245 250 255
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260 265 270
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16

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 Lys Leu Gly Leu Ser Ala Arg Met Gly Ile Glu Val Val Met Arg Gln
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Thr Phe Leu Gly Ser Pro Arg Leu Arg Ala Leu Ala Arg Gly Leu Ser
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Pro Ala Tyr Leu Arg Phe Gly Gly Thr Lys Thr Asp Phe Leu Ile Phe
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Asp Pro Asp Lys Glu Pro Thr Ser Glu Glu Arg Ser Tyr Trp Lys Ser
 100 105 110

Gln Val Asn His Asp Ile Cys Arg Ser Glu Pro Val Ser Ala Ala Val
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Leu Arg Lys Leu Gln Val Glu Trp Pro Phe Gln Glu Leu Leu Leu Leu
 130 135 140

Arg Glu Gln Tyr Gln Lys Glu Phe Lys Asn Ser Thr Tyr Ser Arg Ser
 145 150 155 160

Ser Val Asp Met Leu Tyr Ser Phe Ala Lys Cys Ser Gly Leu Asp Leu
 165 170 175

Ile Phe Gly Leu Asn Ala Leu Leu Arg Thr Pro Asp Leu Arg Trp Asn
 180 185 190

Ser Ser Asn Ala Gln Leu Leu Leu Asp Tyr Cys Ser Ser Lys Gly Tyr
 195 200 205

Asn Ile Ser Trp Glu Leu Gly Asn Glu Pro Asn Ser Phe Trp Lys Lys
 210 215 220

Ala His Ile Leu Ile Asp Gly Leu Gln Leu Gly Glu Asp Phe Val Glu
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 Gln Gly Ala Pro Ala Gly Thr Ala Pro Thr Asp Asp Val Val Asp Leu
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 gag ttt tac acc aag cgg ccg ctc cga agc gtg agt ccc tcg ttc ctg 740
 Glu Phe Tyr Thr Lys Arg Pro Leu Arg Ser Val Ser Pro Ser Phe Leu
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 Ser Ile Thr Ile Asp Ala Ser Leu Ala Thr Asp Pro Arg Phe Leu Thr
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 Phe Leu Gly Ser Pro Arg Leu Arg Ala Leu Ala Arg Gly Leu Ser Pro
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 gca tac ttg aga ttt ggc ggc aca aag act gac ttc ctt att ttt gat 884
 Ala Tyr Leu Arg Phe Gly Gly Thr Lys Thr Asp Phe Leu Ile Phe Asp
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 Val Asn His Asp Ile Cys Arg Ser Glu Pro Val Ser Ala Ala Val Leu
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 Arg Lys Leu Gln Val Glu Trp Pro Phe Gln Glu Leu Leu Leu Leu Arg
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Val Asp Met Leu Tyr Ser Phe Ala Lys Cys Ser Gly Leu Asp Leu Ile	165	170	175	
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Phe Gly Leu Asn Ala Leu Leu Arg Thr Pro Asp Leu Arg Trp Asn Ser	180	185	190	
tcc aac gcc cag ctt ctc ctt gac tac tgc tct tcc aag ggt tat aac				1220
Ser Asn Ala Gln Leu Leu Leu Asp Tyr Cys Ser Ser Lys Gly Tyr Asn	195	200	205	
atc tcc tgg gaa ctg ggc aat gag ccc aac agt ttc tgg aag aaa gct				1268
Ile Ser Trp Glu Leu Leu Asn Glu Pro Asn Ser Phe Trp Lys Lys Ala	210	215	220	225
cac att ctc atc gat ggg ttg cag tta gga gaa gac ttt gtg gag ttg				1316
His Ile Leu Ile Asp Gly Leu Gln Leu Gly Glu Asp Phe Val Glu Leu	230	235	240	
cat aaa ctt cta caa agg tca gct ttc caa aat gca aaa ctc tat ggt				1364
His Lys Leu Leu Gln Arg Ser Ala Phe Gln Asn Ala Lys Leu Tyr Gly	245	250	255	
cct gac atc ggt cag cct cga ggg aag aca gtt aaa ctg ctg agg agt				1412
Pro Asp Ile Gly Gln Pro Arg Gly Lys Thr Val Lys Leu Leu Arg Ser	260	265	270	
ttc ctg aag gct ggc gga gaa gtg atc gac tct ctt aca tgg cat cac				1460
Phe Leu Lys Ala Gly Gly Glu Val Ile Asp Ser Leu Thr Trp His His	275	280	285	
tat tac ttg aat gga cgc atc gct acc aaa gaa gat ttt ctg agc tct				1508
Tyr Tyr Leu Asn Gly Arg Ile Ala Thr Lys Glu Asp Phe Leu Ser Ser	290	295	300	305
gat gcg ctg gac act ttt att ctc tct gtg caa aaa att ctg aag gtc				1556
Asp Ala Leu Asp Thr Phe Ile Leu Ser Val Gln Lys Ile Leu Lys Val	310	315	320	
act aaa gag atc aca cct ggc aag aag gtc tgg ttg gga gag acg agc				1604
Thr Lys Glu Ile Thr Pro Gly Lys Lys Val Trp Leu Gly Glu Thr Ser	325	330	335	
tca gct tac ggt ggc ggt gca ccc ttg ctg tcc aac acc ttt gca gct				1652
Ser Ala Tyr Gly Gly Gly Ala Pro Leu Leu Ser Asn Thr Phe Ala Ala	340	345	350	
ggc ttt atg tgg ctg gat aaa ttg ggc ctg tca gcc cag atg ggc ata				1700
Gly Phe Met Trp Leu Asp Lys Leu Gly Leu Ser Ala Gln Met Gly Ile	355	360	365	
gaa gtc gtg atg agg cag gtg ttc ttc gga gca ggc aac tac cac tta				1748
Glu Val Val Met Arg Gln Val Phe Phe Gly Ala Gly Asn Tyr His Leu	370	375	380	385
gtg gat gaa aac ttt gag cct tta cct gat tac tgg ctc tct ctt ctg				1796
Val Asp Glu Asn Phe Glu Pro Leu Pro Asp Tyr Trp Leu Ser Leu Leu	390	395	400	
ttc aag aaa ctg gta ggt ccc agg gtg tta ctg tca aga gtg aaa ggc				1844
Phe Lys Lys Leu Val Gly Pro Arg Val Leu Leu Ser Arg Val Lys Gly	405	410	415	
cca gac agg agc aaa ctc cga gtg tat ctc cac tgc act aac gtc tat				1892
Pro Asp Arg Ser Lys Leu Arg Val Tyr Leu His Cys Thr Asn Val Tyr	420	425	430	
cac cca cga tat cag gaa gga gat cta act ctg tat gtc ctg aac ctc				1940

His Pro Arg Tyr Gln Glu Gly Asp Leu Thr Leu Tyr Val Leu Asn Leu
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 His Asn Val Thr Lys His Leu Lys Val Pro Pro Pro Leu Phe Arg Lys
 450 455 460 465
 cca gtg gat acg tac ctt ctg aag cct tcg ggg ccg gat gga tta ctt 2036
 Pro Val Asp Thr Tyr Leu Leu Lys Pro Ser Gly Pro Asp Gly Leu Leu
 470 475 480
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 485 490 495
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 Gln Thr Leu Pro Ala Leu Thr Glu Lys Pro Leu Pro Ala Gly Ser Ala
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 35 40 45
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 Thr Phe Leu Gly Ser Pro Arg Leu Arg Ala Leu Ala Arg Gly Leu Ser
 65 70 75 80
 Pro Ala Tyr Leu Arg Phe Gly Gly Thr Lys Thr Asp Phe Leu Ile Phe
 85 90 95
 Asp Pro Asp Lys Glu Pro Thr Ser Glu Glu Arg Ser Tyr Trp Lys Ser
 100 105 110
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Leu Arg Lys Leu Gln Val Glu Trp Pro Phe Gln Glu Leu Leu Leu Leu
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 Arg Glu Gln Tyr Gln Lys Glu Phe Lys Asn Ser Thr Tyr Ser Arg Ser
 145 150 155 160
 Ser Val Asp Met Leu Tyr Ser Phe Ala Lys Cys Ser Gly Leu Asp Leu
 165 170 175
 Ile Phe Gly Leu Asn Ala Leu Leu Arg Thr Pro Asp Leu Arg Trp Asn
 180 185 190
 Ser Ser Asn Ala Gln Leu Leu Leu Asp Tyr Cys Ser Ser Lys Gly Tyr
 195 200 205
 Asn Ile Ser Trp Glu Leu Gly Asn Glu Pro Asn Ser Phe Trp Lys Lys
 210 215 220
 Ala His Ile Leu Ile Asp Gly Leu Gln Leu Gly Glu Asp Phe Val Glu
 225 230 235 240
 Leu His Lys Leu Leu Gln Arg Ser Ala Phe Gln Asn Ala Lys Leu Tyr
 245 250 255
 Gly Pro Asp Ile Gly Gln Pro Arg Gly Lys Thr Val Lys Leu Leu Arg
 260 265 270
 Ser Phe Leu Lys Ala Gly Gly Glu Val Ile Asp Ser Leu Thr Trp His
 275 280 285
 His Tyr Tyr Leu Asn Gly Arg Ile Ala Thr Lys Glu Asp Phe Leu Ser
 290 295 300
 Ser Asp Ala Leu Asp Thr Phe Ile Leu Ser Val Gln Lys Ile Leu Lys
 305 310 315 320
 Val Thr Lys Glu Ile Thr Pro Gly Lys Lys Val Trp Leu Gly Glu Thr
 325 330 335
 Ser Ser Ala Tyr Gly Gly Gly Ala Pro Leu Leu Ser Asn Thr Phe Ala
 340 345 350
 Ala Gly Phe Met Trp Leu Asp Lys Leu Gly Leu Ser Ala Gln Met Gly
 355 360 365
 Ile Glu Val Val Met Arg Gln Val Phe Phe Gly Ala Gly Asn Tyr His
 370 375 380
 Leu Val Asp Glu Asn Phe Glu Pro Leu Pro Asp Tyr Trp Leu Ser Leu
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 Leu Phe Lys Lys Leu Val Gly Pro Arg Val Leu Leu Ser Arg Val Lys

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Gly Pro Asp Arg Ser Lys Leu Arg Val Tyr Leu His Cys Thr Asn Val		
420	425	430
Tyr His Pro Arg Tyr Gln Glu Gly Asp Leu Thr Leu Tyr Val Leu Asn		
435	440	445
Leu His Asn Val Thr Lys His Leu Lys Val Pro Pro Pro Leu Phe Arg		
450	455	460
Lys Pro Val Asp Thr Tyr Leu Leu Lys Pro Ser Gly Pro Asp Gly Leu		
465	470	480
Leu Ser Lys Ser Val Gln Leu Asn Gly Gln Ile Leu Lys Met Val Asp		
485	490	495
Glu Gln Thr Leu Pro Ala Leu Thr Glu Lys Pro Leu Pro Ala Gly Ser		
500	505	510
Ala Leu Ser Leu Pro Ala Phe Ser Tyr Gly Phe Phe Val Ile Arg Asn		
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Ala Lys Ile Ala Ala Cys Ile		
530	535	

<210> 49
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 <212> DNA
 <213> Rattus norvegicus

<400> 49	
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caaagcgtga gtccctcggt cctgtccatc accatcgacg ccagtctggc caccgaccct	180
cggttctctca ctttctctgag ctctccacgg cttcgagccc tgtctagagg cttatctcct	240
gcgtacttga gatttggcgg caccaagact gacttcctta tttttgatcc caacaacgaa	300
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<210> 50
 <211> 541
 <212> DNA
 <213> Rattus norvegicus

<220>
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 <222> (507)..(507)
 <223> Any nucleotide

<400> 50	
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cattaactgt caccacctgc agtgggtctac ttagagaaca ccgcactgga tgttaacact 180
gaagcgcgtg ccccgccctc ccgaggctct ggatccagcg ttgaagcttg ccccgccctc 240
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aaggagtccg ctccctaccg ctggggtttt gctttattct tatgaatgac acccctgacc 360
gctttcgtct caggggtact gtaatgcctt ttattttcat atacaagctg cgattttggc 420
atttcttatg acaaaaaacc cataggaaaa ggcgggcacg cttagtgagc ttctgcggg 480
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<210> 51
<211> 126
<212> PRT
<213> Rattus norvegicus

<400> 51

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Thr Pro Ala Gly Thr Ala Pro Thr Lys Asp Val Val Asp Leu Glu Phe
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Tyr Thr Lys Arg Leu Phe Gln Ser Val Ser Pro Ser Phe Leu Ser Ile
35 40 45

Thr Ile Asp Ala Ser Leu Ala Thr Asp Pro Arg Phe Leu Thr Phe Leu
50 55 60

Ser Ser Pro Arg Leu Arg Ala Leu Ser Arg Gly Leu Ser Pro Ala Tyr
65 70 75 80

Leu Arg Phe Gly Gly Thr Lys Thr Asp Phe Leu Ile Phe Asp Pro Asn
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Asn Glu Pro Thr Ser Glu Glu Arg Ser Tyr Trp Gln Ser Gln Asp Asn
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Asn Asp Ile Cys Gly Ser Asp Arg Val Ser Ala Asp Val Leu
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<210> 52
<211> 44
<212> PRT
<213> Rattus norvegicus

<220>
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<222> (9)..(9)
<223> Xaa can be any naturally occurring amino acid

<400> 52

Leu Lys Met Val Asp Glu Gln Thr Xaa Pro Ala Leu Thr Glu Lys Pro

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				Ser	Val	Pro
					25	Ala
						Phe
						Ser
						Tyr
						30
						Gly
						Phe
Phe	Val	Ile	Arg	Asn	Ala	Lys
		35				
						Ile
						40
						Ala
						Ala
						Cys
						Ile